WHAT IS CLAIMED IS:

1. A fuel supply control device for an internal combustion engine which comprises a combustion chamber formed from a low temperature wall surface and a high temperature wall surface, and a fuel supply mechanism which supplies volatile liquid fuel to the combustion chamber, the device comprising:

a sensor which detects a temperature of the low temperature wall surface;

a sensor which detects a temperature of the high temperature wall surface; and

a programmable controller programmed to:

calculate respectively a fuel amount adhering to the low temperature wall surface, a fuel amount adhering to the high temperature wall surface, and a first vaporized fuel amount that is supplied in the form of gas or mist of fine particles in the combustion chamber relative to a fuel amount supplied by the fuel supply mechanism;

calculate a second vaporized fuel amount which vaporizes from the fuel adhering to the low temperature wall surface and burns, according to the temperature of the low temperature wall surface;

calculate a third vaporized fuel amount which vaporizes from the fuel adhering to the high temperature wall surface and burns, according to the temperature of the high temperature wall surface;

calculate a combustion fuel amount in the combustion chamber based on the first vaporized fuel amount, the second vaporized fuel amount, and the third vaporized fuel amount;

calculate a target fuel injection amount based on the combustion fuel

amount; and

control a fuel amount to be supplied by the fuel supply mechanism according to the target fuel injection amount.

2. The fuel injection control device as defined in Claim 1, wherein the controller is further programmed to increase the second vaporized fuel amount relative to the fuel amount supplied by the fuel supply mechanism as the temperature of the low temperature wall surface rises, and to increase the third vaporized fuel amount relative to the fuel amount supplied by the fuel supply mechanism as the temperature of the high temperature wall surface rises.

3. The fuel injection control device as defined in Claim 1, wherein the engine further comprises a piston which expands and contracts the combustion chamber, and an intake passage which aspirates air into the combustion chamber according to an expansion of the combustion chamber, the device further comprises a sensor which detects an intake negative pressure of the engine, and the controller is further programmed to increase the second vaporized fuel amount and the third vaporized fuel amount relative to the fuel amount supplied by the fuel supply mechanism as the intake negative pressure increases.

4. The fuel injection control device as defined in Claim 1, wherein the engine comprises a piston which expands and contracts the combustion chamber, a cylinder which houses the piston and is cooled by cooling water, and a cylinder head, the combustion chamber being formed by a wall surface of the cylinder, a crown of the piston and a wall surface of the cylinder head, the low temperature

wall surface comprises the wall surface of the cylinder, and the high temperature wall surface comprises the crown of the piston and the wall surface of the cylinder head.

5. The fuel injection control device as defined in Claim 4, wherein the engine further comprises an intake passage, an intake port formed in the cylinder head which connects the intake passage and combustion chamber, and an intake valve which opens and closes the intake port, and the fuel supply mechanism comprises a fuel injector which injects fuel towards the intake valve in the intake port.

6. The fuel injection control device as defined in Claim 5, wherein the device further comprises a sensor which detects a temperature of a gas which circulates through the intake port, and the controller is further programmed to increase the first vaporized fuel amount relative to the fuel amount supplied by the fuel supply mechanism.

7. The fuel injection control device as defined in Claim 1, wherein the engine further comprises an exhaust passage, an exhaust valve which discharges exhaust gas from the combustion chamber to the exhaust passage, and a three-way catalytic converter which purifies the exhaust gas in the exhaust passage, the device further comprises a sensor which detects a catalyst temperature of the three-way catalytic converter, and the controller is further programmed to calculate a fourth vaporized fuel amount which is vaporized from the fuel adhering to the low temperature wall surface and discharged to the exhaust passage without burning according to the temperature of the low temperature wall surface, calculate a fifth

vaporized fuel amount which is vaporized from the fuel adhering to the high temperature wall surface and discharged to the exhaust passage without burning according to the temperature of the high temperature wall surface, and determine the target fuel injection amount after the catalyst temperature has reached an activation temperature based on a total amount of the combustion fuel amount in the combustion chamber, the fourth vaporized fuel amount and the fifth vaporized fuel amount to cause an exhaust gas composition in the exhaust passage to correspond with a stoichiometric air-fuel ratio.

8. The fuel injection control device as defined in Claim 7, wherein the engine comprises an engine for driving a vehicle provided with an accelerator pedal, the device comprises a sensor which detects an accelerator pedal depression amount, and the controller is further programmed to, when the accelerator pedal depression amount exceeds a predetermined amount, determine the target fuel injection amount based on the combustion fuel amount to cause the engine to operate under a predetermined rich air-fuel ratio.

9. The fuel injection control device as defined in Claim 7, wherein the controller is further programmed to measure an elapsed time from startup of the engine, and until the elapsed time reaches a predetermined engine warm-up time, determine the target fuel injection amount based on the combustion fuel amount to cause the engine to operate under a predetermined rich air-fuel ratio.

10. The fuel injection control device as defined in Claim 1, wherein the engine comprises an intake passage, a cylinder head, an intake port formed in the

cylinder head which connects the intake passage and the combustion chamber, and an intake valve which opens and closes the intake port, the fuel supply mechanism comprises a fuel injector which injects fuel towards the intake valve in the intake port, the controller is further programmed to respectively calculate a fuel amount adhering to the wall surface of the intake port, a fuel amount adhering to the intake valve, a first wall flow amount adhering directly to the low temperature wall surface, and a second wall flow amount adhering directly to the high temperature wall surface, relative to the fuel amount supplied by the fuel supply mechanism, calculate a third wall flow amount which has moved from the wall surface of the intake port and adhered to the low temperature wall surface and a fourth wall flow amount which has moved from the wall surface of the intake port and adhered to the high temperature wall surface, calculate a fifth wall flow amount which has moved from the intake valve and adhered to the low temperature wall surface and a sixth wall flow amount which has moved from the intake valve and adhered to the high temperature wall surface, calculate the fuel amount adhering to the low temperature wall surface based on the first wall flow amount, third wall flow amount and fifth wall flow amount, and calculate the fuel amount adhering to the high temperature wall surface based on the second wall flow amount, fourth wall flow amount and sixth wall flow amount.

11. The fuel injection control device as defined in Claim 10, wherein the controller is further programmed to calculate a sixth vaporized fuel amount flowing into the combustion chamber which is a part of the fuel amount adhering to the wall surface of the intake port, and a seventh vaporized fuel amount flowing into the combustion chamber which is a part the fuel adhering to the intake valve, and

calculate the combustion fuel amount based on the first vaporized fuel amount, the sixth vaporized fuel amount, and the seventh vaporized fuel amount.

12. The fuel injection control device as defined in Claim 11, wherein the device further comprises a sensor which detects a cooling water temperature of the engine, and the controller is further programmed to increase the first vaporized fuel amount as the cooling water temperature increases.

13. The fuel injection control device as defined in Claim 12, wherein the device further comprises a sensor which detects a temperature of the intake valve, and the controller is further programmed to calculate the temperature of the wall surface of the intake port from the cooling water temperature, increase the sixth vaporized fuel amount relative to the fuel amount adhering to the wall surface of the intake port as the temperature of the wall surface of the intake port rises, and increase the seventh vaporized fuel amount relative to the fuel adhering to the intake valve as the temperature of the intake valve rises.

14. The fuel injection control device as defined in Claim 11, wherein the device further comprises a sensor which detects an intake negative pressure of the engine, and the controller is further programmed to increase the first vaporized fuel amount as the intake negative pressure increases.

15. The fuel injection control device as defined in Claim 11, wherein the device further comprises a sensor which detects an intake negative pressure of the engine, and the controller is further programmed to increase the seventh vaporized

fuel amount relative to the fuel adhering to the intake valve as the intake negative pressure increases.

16. The fuel injection control device as defined in Claim 11, wherein the controller is further programmed to calculate the first vaporized fuel amount, the fuel amount adhering to the wall surface of the intake port, the fuel amount adhering to the intake valve, the first wall flow amount, and the second wall flow amount relative to the fuel amount supplied by the fuel supply mechanism, according to a fuel injection timing of the fuel injector.

17. A fuel supply control device for an internal combustion engine which comprises a combustion chamber formed from a low temperature wall surface and a high temperature wall surface, and a fuel supply mechanism which supplies volatile liquid fuel to the combustion chamber, the device comprising:

means for detecting a temperature of the low temperature wall surface;

means for detecting a temperature of the high temperature wall surface;

means for calculating respectively a fuel amount adhering to the low temperature wall surface, a fuel amount adhering to the high temperature wall surface, and a first vaporized fuel amount that is supplied in the form of gas or mist of fine particles in the combustion chamber relative to a fuel amount supplied by the fuel supply mechanism;

means for calculating a second vaporized fuel amount which vaporizes from the fuel adhering to the low temperature wall surface and burns, according to the temperature of the low temperature wall surface;

means for calculating a third vaporized fuel amount which vaporizes from the

fuel adhering to the high temperature wall surface and burns, according to the temperature of the high temperature wall surface;

means for calculating a combustion fuel amount in the combustion chamber based on the first vaporized fuel amount, the second vaporized fuel amount, and the third vaporized fuel amount;

means for calculating a target fuel injection amount based on the combustion fuel amount; and

means for controlling a fuel amount to be supplied by the fuel supply mechanism according to the target fuel injection amount.

18. A fuel supply control method for an internal combustion engine which comprises a combustion chamber formed from a low temperature wall surface and a high temperature wall surface, and a fuel supply mechanism which supplies volatile liquid fuel to the combustion chamber, the method comprising:

determining a temperature of the low temperature wall surface;

determining a temperature of the high temperature wall surface;

calculating respectively a fuel amount adhering to the low temperature wall surface, a fuel amount adhering to the high temperature wall surface, and a first vaporized fuel amount that is supplied in the form of gas or mist of fine particles in the combustion chamber relative to a fuel amount supplied by the fuel supply mechanism;

calculating a second vaporized fuel amount which vaporizes from the fuel adhering to the low temperature wall surface and burns, according to the temperature of the low temperature wall surface;

calculating a third vaporized fuel amount which vaporizes from the fuel

adhering to the high temperature wall surface and burns, according to the temperature of the high temperature wall surface;

calculating a combustion fuel amount in the combustion chamber based on the first vaporized fuel amount, the second vaporized fuel amount, and the third vaporized fuel amount;

calculating a target fuel injection amount based on the combustion fuel amount; and

controlling a fuel amount to be supplied by the fuel supply mechanism according to the target fuel injection amount.